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COMMANDERS DIGEST
VOL. 19, NO. 20/SEPTEMBER 23, 1976

CRUISE MISSILE: Double Insurance for Defense

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The Department of Defense is continuing the development of the strategic cruise missiles principally as a major alternative approach to penetration of formidable Soviet air defenses. The cruise missiles that are under development are unique in that they are a low radar cross section aerodynamic vehicle capable of flying at very low altitude for hundreds of miles according to a pre-planned course to deliver a warhead to target with pinpoint accuracy. These capabilities make cruise missiles complementary to both a naval vessel and a penetrating bomber. For the air launch applications, the cruise missile enhances bomber penetration and survival by extending the stand off range and by diluting hostile air defenses. It augments bomber effectiveness by the extreme accuracy of the missile guidance system and its ability to strike targets without need for the bomber to overfly each one. For the sea-launched applications, particularly from submarines, the cruise missile constitutes a very survivable secure reserve force for strategic retaliation. Furthermore, the guidance accuracy renders it a very effective option in limited nuclear engagements. (Continued next page)

SEPARATE PROGRAMS

The approach to DoD's cruise missile development has been to pursue two separate programs with subsystem commonality. By insisting on commonality at the costly subsystem level but accommodating the peculiar launch platform and environment with different optimized airframe designs, the Defense Department is benefitting from top performance while reducing overall costs.

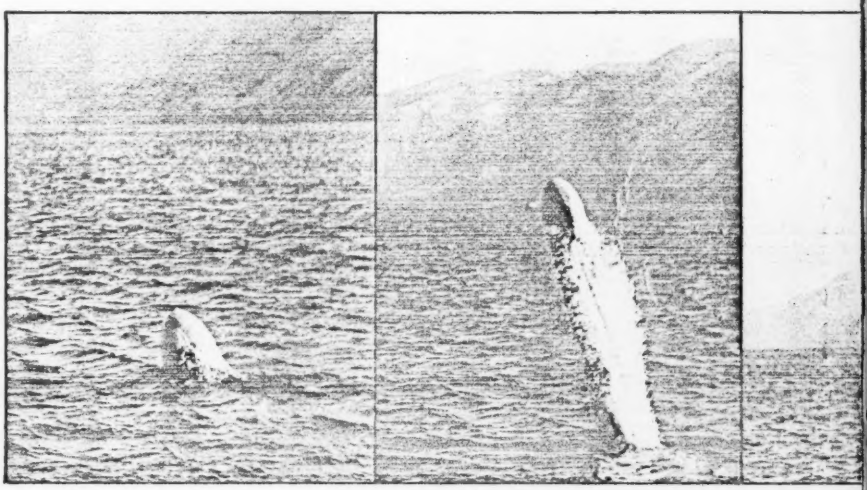
Both cruise missile programs have been progressing at an orderly pace and with much success. One program, conducted by the Air Force, is the Air Launched Cruise Missile (ALCM) designed primarily for the B-52 bomber so that it is physically and electronically interchangeable with the Short Range Attack Missile (SRAM) weapon in the B-52 SRAM rotary rack and on the B-52 SRAM wing pylon. In the former case, the ALCM would be carried inside the B-52 bomb bay and deliver a nuclear warhead accurately to a target hundreds of miles away. When carried under the B-52 wing, the ALCM could be fitted with a jettisonable belly tank or could be lengthened to more than double the range of its basic configuration. The ALCM has demonstrated an extremely low radar cross section and has a performance goal to cruise at high subsonic speed at very low altitude to avoid defense detection. The first powered flight test of an ALCM was completed successfully on March 5, 1976 from a B-52G bomber over the White Sands Missile Range.

The second cruise missile program, conducted by the Navy, is the Tomahawk, designed primarily to be launched from an SSN torpedo tube. The large torpedo tube dimensions enable the Tomahawk design to take advantage of the large volume available for fuel storage; thus the Tomahawk is capable of very long range. The Tomahawk also has an extremely low radar cross section and cruises at low altitude to deliver its warhead to target, with accuracy similar to that of the ALCM. Furthermore, the Tomahawk is readily adaptable to launches from surface ships and from land vehicles. With appropriate modifications, the Tomahawk also can be launched from the B-52. The Navy has demonstrated successfully the concept of underwater launch of a Tomahawk from a submerged torpedo tube at San Clemente, California, in February 1976.

The Tomahawk and the ALCM use the same Terrain Contour Matching (TERCOM) guidance system, the same Williams turbofan engine, and the same nuclear warhead. Thus the most costly components of the cruise missiles will be essentially identical in the two cruise missiles under development. The only difference is in the airframes which, as mentioned previously, are designed for specific carrier platforms and environment.

SINGLE REQUIREMENT

To emphasize further the efforts being made to achieve maximum commonality, the warheads for the ALCM B-1 Tomahawk and for the short-range attack missile have been considered into a single requirement. The development and use of a single warhead for these three systems should result in significant saving for the Government.



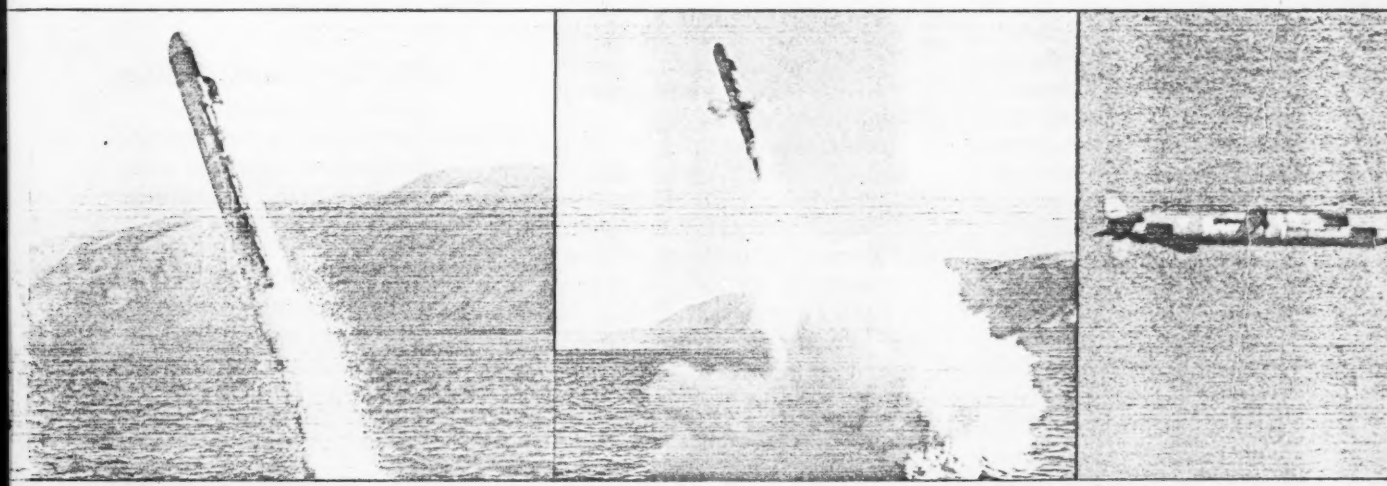
Equipped with a conventional warhead, a variant of the nuclear Tomahawk is also under concurrent development for the anti-ship mission. Like the nuclear Tomahawk, the conventional Tomahawk can be launched from a variety of platforms. It will have the same airframe and underwater rocket booster as the strategic Sea Launched Cruise Missile (SLCM). Its guidance is derived from that of Harpoon and its conventional warhead is the Bullpup B now in the inventory.

To maintain further a competitive environment and to arrive at the most cost-effective weapon, DoD is investigating, through a study of design modifications, the option to carry and launch the Tomahawk from the B-52. Such a study will be completed this fall. Essentially there will be a trade between: (a) the additional costs of developing two cruise missiles, one for sea launch only, and one for bomber launch only; and (b) the additional costs of bomber and missile modifications to accommodate the changes necessary for carrying the Tomahawk. When the program validation phase is completed, the Defense Department plans to make the final choice of the missile for the bomber launch.

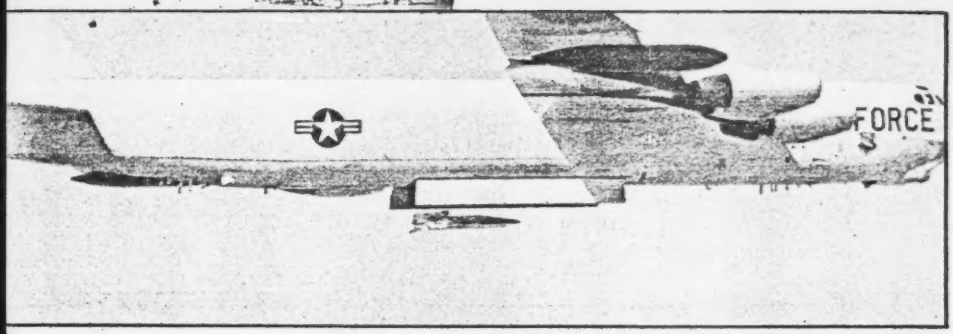
VALUE AND RANGE

The relative value of cruise missiles and the necessary range of these vehicles have been the subjects of broad discussion. While it is not intended to develop rationale in depth for either mission or range requirements, a few comments may indicate why Defense believes it is necessary to pursue vigorously this effort.

The value of the cruise missile lies in its ability to attack, with high probability of success, targets which are not terminally defended. This type of target comprises the vast majority of the target list. In the process of executing their attack, cruise missiles also provide a "bonus" to the penetrating bomber force. This "bonus" is the dilution and decoy effect presented by many hundreds of vehicles operating in the air defense net. The obvious benefit is improved bomber enroute survivability. It is important, too, to realize that cruise missiles can contribute to more efficient utilization of bomber/tanker assets by acting as extensions of the launch platform, and destroying outlying and isolated targets. Bomber range thus saved can be converted into more payload or higher probability of bomber recovery through increased low level flight. Finally, the cruise missile represents a high-leveraged investment since it uses existing launch platforms on the one hand and forces the



A cruise missile breaks the surface of the water after a sub-surface launch (left photo) and progresses until it levels off in flight (right photo)



An Air Force ALCM is launched from the bay of a B-52.

Soviets to field new (or better) costly air defenses on the other.

ADDITIONAL FEATURE

The nuclear Tomahawk contributes an additional feature as a strategic weapon. Its ubiquitous capability of deployment on land, sea and air launchers could complicate the defenses further and could provide a distinct surge capability in a survivable reserve force. Its variant, with larger conventional warhead and longer stand-off distance than the Harpoon, enhances significantly the United States' anti-ship capability.

In terms of range, it should be clear that DoD requires far more in cruise missiles than the Soviets do. This is due to basic differences in geography and the locations of high value targets within that geography. For example, a 600 kilometer sea-launched cruise missile would be of military value for the Soviets since about half of the U.S. population centers and industrial plants are located within 300 miles of the coastline. However, such a short range would be inadequate for the United States because the strategic target locations would be out of reach from U.S. submarines.

The United States at present is unquestionably in the lead in the advanced technologies of efficient cruise propulsion systems and of accurate guidance systems, without either of which a long-range cruise missile cannot be an effective weapon. In the course of DoD's cruise missile development, full advantage is being taken of this lead to provide an offensive dimension for bombers and submarines not achievable by any other means at equal cost.

FY 1977 EFFORTS SUMMARY

Without going into the details of the two cruise missile programs, the following is a brief summary of the FY 1977 efforts:

- For the ALCM program DoD requests $79.2 million for FY 77. The first flight test ALCM vehicle was delivered in November 1975. The first powered flight was completed on March 5, 1976. The first fully guided flight is scheduled for September 1976. During this current calendar year, seven flights are planned to verify launch compatibility with the B-52, aerodynamic characteristics, and range and guidance package performance.
- The FY 77 request for the Tomahawk program is $182.5 million. The higher funding needed is due to the broader scope and faster pace of the program as compated with the ALCM program. In addition to the basic nuclear configuration, the Tomahawk program has a conventional variant in concurrent development. The adaptability of the Tomahawk to launch platforms other than the submarine incurs substantially more study and design efforts. The program has a planning Initial Operational Capability (IOC) two years ahead of that of ALCM. First powered flight for the conventional Tomahawk was completed in May 1976 to be followed by 14 additional flights of both variants to verify the aerodynamic characteristics and range and guidance package performances.

I believe that both cruise missile programs have progressed successfully. With Congressional approval, the cruise missiles, which complement and augment the capability of the U.S. bomber and sea based forces, will be continuously developed with DoD's vigorous but orderly research and development efforts.

COMMANDERS DIGEST

Vol. 19, No. 20, September 23, 1976

A publication of the Department of Defense to provide official and professional information to commanders and key personnel on matters related to Defense policies, programs and interests, and to create better understanding and teamwork within the Department of Defense.

Published bi-weekly by the American Forces Press Service, 1117 N. 19th St., Arlington, Va. 22209, a unified activity of the Office of Information for the Armed Forces, OASD (PA). Reproduction of content is authorized.

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Subscription Price: $17.00 domestic per year; $4.00 additional for foreign mailing; 65 cents per single copy.
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